

the present book. Such a work need not necessarily greatly exceed the "Leitfaden" in bulk, for the classifications, excellent though they are, and the general summary of the different groups might safely be left to the lecturer or text-book. This, together with the omission of some of the less important groups, would allow space for more practical instruction in manipulation and for a somewhat fuller treatment of most of the different types described, more especially of those of the vertebrates.

On the whole, it may be said that the present work bears the stamp of originality; the style is clear and the descriptions are terse and generally accurate, and if in a future edition Dr. Kükenenthal should see fit to remodel his book in such a manner as suggested, it would be welcomed in our colleges as a valuable and much-needed aid to the beginner in the laboratory. E. W.

FERMENTS AND FERMENTATION.

Ferments and their Actions. By Carl Oppenheimer, M.D., Ph.D., and translated and amended by C. Ainsworth Mitchell, B.A., F.I.C. Pp. xii + 343. (London: C. Griffin and Co., Ltd., 1901.) Price 7s. 6d. net.

THERE are few subjects more interesting and at the same time more difficult than the study of ferments and their actions. But many students, and not a few original workers, shrink from the study of ferments owing to the great complexity of the subject. A book, therefore, which aims at treating the subject in a concise and intelligible manner must inevitably attract a wide class of readers.

The author very properly points out that it is impossible to understand any of the problems relating to fermentation unless there be formulated some definition of a ferment *per se* and some simple conception of the process of fermentation. With this object, in the second chapter the writer gives us what he considers a simple definition of the notion ferment:—

"A ferment is the material substratum of a peculiar form of energy, which is produced by living cells and adheres more or less firmly to them without having its activity bound up with the vital process as such; this energy is in a condition to bring about the liberation of latent (potential) energy of chemical substances and its conversion into kinetic energy (heat, light), in such manner that the chemical substance is so changed in the process that the new substance or the sum of the new substances produced possesses a smaller potential energy (*i.e.* a smaller heat of combustion) than the original substance."

It must be confessed that, however scientifically perfect this definition may seem to be, it will not impress the average reader with the idea of its simplicity. But the distinguished author goes on to elucidate the different heads of this definition, and in so doing makes clear even to the lay reader many vital points bearing on this difficult subject.

The following frank acknowledgment of the ignorance which underlies all our conceptions of the ways and means by which fermentative processes develop their activity is worth quoting in full:—

"We must simply resolve to regard fermentative actions as special phenomena of the ominous 'catalytic'

processes from which their differentiation is required by the fact that they are produced by living cells. Catalytic action is nothing more than a scheme of despair under which we may group chemical reactions which, while possessing a certain similarity in their course, cannot, without further knowledge, be explained by our simple chemical theories. With the advance of our knowledge, we have naturally been able to assign many phenomena which were formerly regarded as catalytic to simpler chemical laws, so that this useful idea has undergone a considerable limitation in its applicability. At the same time we must not forget that in its essence even the theory of simple chemical decompositions and of chemical affinity is, as regards our theoretical knowledge, only one vast enigma; that we have only been much longer accustomed to deal with these conceptions as indispensable fundamental axioms without being able to approach them otherwise than metaphysically, which also holds good in a still wider sense of the conceptions of matter and force in general."

Chapter iii., on the chemical nature of ferments, is well worth the most careful perusal. It is the fault of the subject, not of the writer, that it makes stiff reading. In this chapter the author points out the uselessness of such vague expressions, which lead nowhere, as that there are in ferments "fragments of protoplasm" endowed with "residues of vital force." Gautier's dissolved cell hypothesis is very ably discussed.

The influence of external factors on the action of ferments is concisely dealt with in chapter iv., and chapter v., on the mode of action of ferments, is perhaps the most interesting in a book all of which is full of matter of absorbing interest and importance.

But it is impossible within the scope of this short review to touch on more than a fraction of the points in the work, which will repay study by both the layman and the expert in this subject.

A. C. HOUSTON.

OUR BOOK SHELF.

Civil Engineering as applied in Construction. By Leveson F. Vernon Harcourt. "Longmans' Engineering Series." Pp. xv + 624; with 368 illustrations. (London, New York and Bombay: Longmans, Green and Co., 1902.) Price 14s. net.

THIS book, as the author states in the preface, consists of a concise grouping together of the various branches of constructive civil engineering.

A book that attempts to deal in a single volume with the vast range of subjects embraced in civil engineering must necessarily be more in the nature of an encyclopædia than a series of treatises on the subjects dealt with; and the descriptions of the works selected as examples are, therefore, necessarily limited to as small a space as is possible for the elucidation of the various subjects, and for indicating the practice followed in the execution of constructive works; but what is given is of a thoroughly practical character, and the subjects are very fully illustrated. The author has not taken up space by dealing with theories, or by giving elaborate formulæ.

The information given has been derived to a very large extent from *Proceedings* of the Institution of Civil Engineers, of which the author gives full acknowledgment.

The book should be of great use to an engineer when called upon to deal with constructive works of a character that he has not had previous experience of, as indicating the various ways in which constructive requirements have been treated. To students of engineering it will be of value in directing attention to the principles forming the

basis of design and construction, and by indicating the different ways in which these principles have been applied in practice.

The volume may, in fact, be regarded as a guide-book to what has been done, but its usefulness would have been enhanced if more frequent references had been made to the sources from which complete information on the different subjects could be obtained, or if a list of the works in which the subjects have been treated had been given at the end of each chapter. It is true that in such matters as harbours, docks and canals, with which the author is most conversant, the references from which the information is taken are plentifully given; but these are principally to the author's own works, and no mention is even made of the works on these subjects that have been published within the last few years in "Longmans' Engineering Series," of which this book forms part.

Besides a general introduction, the subjects are dealt with under five heads, and include (1) materials employed in construction; preliminary arrangements for carrying out work; excavation; dredging; pile-driving; cofferdams; foundations; piers of bridges; roads and street-paving. (2) Laying out and formation of railways; bridges; viaducts; tunnels; permanent way; light railways and tramways. (3) Control and regulation of rivers; canals and canalised rivers; ship canals; and irrigation works. (4) Docks, river quays, harbour works; lighting coasts and channels; land reclamation and coast protection. (5) Sanitary engineering, including water supply and sewerage works.

Rural Reader—Senior. By V. T. Murché. Pp. 292. Price 1s. 9d.

The Teacher's Manual of Object Lessons for Rural Schools—Senior. By V. T. Murché. Pp. xxiii+396. (London: Macmillan and Co., Ltd., 1902.) Price 2s. 6d.

THE schoolmaster in the country is just now very much in want of a text-book to guide him in giving that kind of instruction which is variously termed "nature knowledge" or "rural economy"; such elementary observation and reasoning applied to common things, as will stimulate the child's mind and yet serve as an introduction to agriculture or horticulture later. Mr. Murché was ready with two text-books very soon after the circular from the Board of Education in 1900, and now comes forward with two more for senior children, a reading book for school use and a parallel series of object lessons set out for the teacher's benefit.

The scope of the books is extensive enough—a little chemistry and botany, a few discourses on farming, then comes a considerable section on insect life, with chapters on fishes, reptiles, trees and ferns to the end. The get-up is excellent, nice type and plenty of pictures, so that any child will enjoy the varied course of the reader, and the teacher may get many excellent hints from the object lessons. But how fatally does the author miss the whole spirit of the work, which is to make the child see and think and find out things for himself. From beginning to end of the book the child is being told in dogmatic fashion scraps of information about natural objects of the most unequal degree of importance. The book is a typical compilation; in each subject the man who knows will detect, if not mistakes, yet that want of proportion, that emphasis in the wrong place, which mark the writer at second hand.

For example, on p. 63 the children are made to compare the flower of the Deadly Nightshade, *Atropa*, with the potato flower, to show them how a garden plant may have wild relations. In the first place, there is little superficial resemblance between the flowers, and *Atropa* is a really rare and casual plant in England, whereas every hedgerow contains the "Woody Nightshade," poisonous enough and with flowers that are unmistakably

the fellows of the potato flower. Again, we notice on p. 127 an account of the mole cricket, with a picture; how many collectors, not to speak of children, have ever found a mole cricket? And so the book goes on through the whole gamut of animated nature; our feeling in the end is one well known to examiners, "I suppose I must allow some marks for this, but—" We have not yet found the text-book for country schools, and we are afraid that Mr. Murché's is just a sufficiently middling substitute to block the way of the real article when it comes.

A. D. H.

Poultry Management on a Farm. By Walter Palmer, M.P. Pp. 94. (Westminster: Archibald Constable and Co., Ltd., 1902.) Price 1s.

THE object of this work is to show that poultry in considerable numbers can be kept on an ordinary farm with profit. Mr. W. Palmer, M.P., on land of about 200 acres, has established a poultry department. 350*l.* have been expended in buildings and the necessary appliances, a skilled manager with three assistants have been appointed, and the results of three years' work are very fairly given in this well-printed and well-illustrated, but very cheap, volume. Whether the results are such as will induce many other agriculturists to go into the pursuit or not may be regarded as doubtful, but the volume is well worthy the attention of those who are interested in the matter. Poultry farms pure and simple have long been known to be visionary, those institutions at present going under that name not being utility poultry farms, but places for the rearing and sale of fancy stock at fancy prices. Mr. Palmer is an enthusiast in his subject, and it is needless to say that his work presents the results of his experiments in the most favourable light, but this is obviously done with a good motive and in an exceedingly truthful manner. Many practical farmers would, however, object to his figures. Nothing is charged for the annual depreciation and wear and tear of the plant. The annual value of the manure of the two thousand birds is estimated at 100*l.* Moreover, the author states that if the ninety thousand farms in England were all to keep poultry on the plan recommended by himself, the profit arising from this source would be no less than four and a half millions a year to the British farmer. These statements will be differently estimated by different readers.

Lectures on the Lunar Theory. By John Couch Adams M.A., F.R.S. Edited by R. A. Sampson, M.A. Pp. 88. (Cambridge University Press, 1900.) Price 5s.

WE are glad to see that the famous lectures of Adams on the lunar theory have been published so as to be readily accessible to all. They have been well edited and most lucidly presented to the reader. Prof. Sampson naturally, however, did not feel at liberty to extend the subject-matter of the lectures, so that the work remains in a slighter form than Prof. Adams would, perhaps, himself have cared to publish it.

This being so, we are led to ask—What class of readers does this book specially cater for? We do not think the students, for the book cannot compete with Dr. E. W. Brown's treatise, nor would it be of any great value to the calculator who should wish to develop afresh correct expressions for the moon's coordinates, for the chief difficulties here consist in the correction of approximate solutions, a section to which only four pages (pp. 30-33) is devoted in the present work, and, moreover, the action of the planets is not considered. Perhaps, then, the class that will find this book most interesting are the astronomers, who from time to time want to refer to small portions of the theory and obtain numerical values for some of the quantities that occur. This was, perhaps, not the design of the work, but we can recommend it as serving this purpose thoroughly.